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JOB REDESIGN FOR OLDER WORKERS--CASE STUDIES.

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INDUSTRIAL ESTABLISHMENTS SUCCESSFULLY USED METHODS OF JOB REDESIGN TO MAINTAIN THE EMPLOYMENT AND PRODUCTIVITY, AS WELL AS THE MORALE, OF AGING EMPLOYEES. EXAMPLES OF JOB REDESIGN WERE FOUND IN A WIDE VARIETY OF MANUFACTURING INDUSTRIES. CASE STUDIES WERE MADE IN PLANTS PRODUCING AIRCRAFT ENGINES, ALUMINUM FRAMING, BUILDING MATERIALS, CARPETS, COMPUTERS, COPPER PIPE FITTINGS, FOOTWEAR, HEAVY IRON PIPE, PRECISION INSTRUMENTS, AND PRINTED NOVELTIES. THE MOST PREVALENT REDESIGN METHOD WAS THE INFORMAL PRACTICE OF ACCOMMODATING THE DECLINING PHYSICAL CAPACITIES OF A SPECIFIC AGING WORKER OR GROUP OF WORKERS. JOB REDESIGN REVEALED SOME ADVANTAGES OVER THE PRACTICE OF JOB REASSIGNING FOR BOTH THE OLDER WORKER AND MANAGEMENT. IN SEVERAL CASES, A SUBSTANTIAL RISE IN OUTPUT PER MAN-HOUR OCCURRED. IN NONE OF THE CASES WAS PRODUCTIVITY ADVERSELY AFFECTED. THE FOUR CASE STUDIES SUMMARIZED SHOW JOB REDESIGN USING THE FRAMEWORK FOR FORMAL JOB PLACEMENT PROGRAMS WHICH CONTINUALLY EVALUATED EACH JOB AND EMPLOYEE IN TERMS OF DEMANDS AND CAPACITIES, UTILIZING MECHANICAL AIDS TO REPLACE MANUAL CONTROL, UTILIZING TECHNOLOGICAL CHANGE IN THE FORM OF SPECIALLY DESIGNED FORKLIFT TRUCKS, AND INVOLVING REALLOCATION OF DUTIES. THE FULL STUDY IS PRESENTED IN THE BUREAU OF LABOR STATISTICS PUBLICATION "JOB REDESIGN FOR OLDER WORKERS, TEN CASE STUDIES." THIS DOCUMENT APPEARED IN THE "MONTHLY LABOR REVIEW," JANUARY 1967. (HC)

Job Redesign for Older Workers: Case Studies

JOBS ARE CONSTANTLY being redesigned or altered for the purpose of improving production methods and plant efficiency. To the extent that the changes result in the reduction of various fatiguing tasks, they greatly benefit older workers, who are more affected by physical strain than the younger ones. But rarely are jobs adapted specifically to the declining physical capacities of older workers. In some instances, job redesign is the only way of keeping at the job aging employees who are still productive, a goal which is especially desirable under current conditions of labor shortage.

Apart from such immediate economic considerations, however, job redesign for older workers has important advantages from the standpoint of human and social values. By easing job strains, application of the job redesign principle protects the health and morale as well as the income of older workers.

This article describes how 10 industrial establishments in the United States successfully used methods of job redesign to maintain the employment and productivity, as well as the morale, of aging employees. It is based on the findings of a study conducted by the Bureau of Labor Statistics.[1]

The study's objective was to locate and report on cases of job redesign specifically related to problems of older workers. The individual case studies were carried out through interviews with officials of 10 companies which were selected for field visits from 284 firms that had replied to a mail canvass. The replies represented 56 percent of a total of 500 manufacturing companies, drawn from the *Fortune* plant and product directory of the 1,000 largest U.S. industrial corporations, which had been queried concerning their practices in aiding older workers through job adjustment.

Examples of job redesign were found in a wide variety of manufacturing industries. The case studies included plants producing aircraft engines, aluminum framing, building materials, carpets, computers, copper pipe fittings, footwear, heavy iron pipe, precision instruments, and printed novelties. Employment at these plants ranged from fewer than 100 to many thousands of workers.

Some of the older workers whose jobs were redesigned were employed as low-paid porters, others were semiskilled machine operators, and a few were highly skilled craftsmen. Most of the workers affected were older men and women whose physical condition had not substantially affected their performance, but in several cases ailments had significantly reduced work capacity.

Only one of the cases studied—at the aircraft engine plant—involved a formal program of job adaptation to the functional capacities of workers, with participation by medical and other specialized personnel. More prevalent among the cases studied was the informal practice of redesigning jobs to improve operational efficiency of a specific aging worker or group of workers, by accommodating declining physical capacities. This practice was also used to retain at the job older workers who had suffered an illness that made it impossible for them to continue work under existing conditions. In these informal job redesign situations, the changes were generally effected with a minimum of fuss and at relatively little cost by the plant managers and foremen.

Where a group of workers were involved, the job adaptations were accomplished by removing the more strenuous tasks, such as heavy lifting, pushing, pulling, or carrying, from the older workers and assigning them to the younger ones in the same group. Mechanization resulting in job redesign for some older workers made their tasks much easier to perform. It also brought about displacement of workers in some cases, reassignment or retirement in others.

In several cases, a substantial rise in output per man-hour occurred as a result of the redesign. At the computer manufacturing plant, the substitution of tape recorded for visual instructions and

[1] The full study will be presented in a forthcoming BLS bulletin, *Job Redesign for Older Workers: Ten Case Studies*, prepared by the BLS under contract to the Office of Manpower Policy, Evaluation and Research, under Title I of the Manpower Development and Training Act. In recent years, the Organization for Economic Cooperation and Development has sponsored a series of seminars, several research publications, and a survey of cases on job redesign (of which the study is a part) in several countries. For example, see Stephen Griew, *Job Redesign* (Paris, Organization for Economic Cooperation and Development, 1965).

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easier, more systematic access to components reduced work fatigue factors for a group of assembly workers age 45 and over. Output in the operation tripled and assembly errors were reduced to a minimum. In none of the cases studied was productivity adversely affected.

The case studies revealed that job redesign had some advantages for both the older worker and management, over the practice of reassigning such workers to other jobs. When the requirements of their jobs were eased, some older workers who were still productive continued to perform the tasks they knew, in their customary work places, rather than being shifted to unfamiliar work and surroundings. They continued to use their experience and skills and, with one exception, maintained or increased their prior earnings levels. Their employers benefited from the use of their skills. Job redesign made possible the retention of some skilled workers with declining capacities for whom reassignment or early retirement would not have been feasible.

Four of the ten individual case studies are summarized below. The first presents an application of job redesign within the framework of a formal job placement program. The others reflect studies with less formal procedures: in one, more mechanical aids replaced manual controls; in another, job redesign resulted from technological change; in the third, the redesign involved reallocation of duties among a group of workers.

Electric Motor Repairman

A plant manufacturing aircraft engines had many thousands of employees, of whom two-thirds were production workers. The plant's formal and very thoroughgoing job analysis and employee placement programs were designed to provide continuing evaluations of each job in terms of physical demands, and of each employee in terms of his functional capacities, as well as necessary arrangements to assure that the job and the incumbent were matched.

This case study relates to the redesign of the job of an electric motor repairman, age 46, who had worked primarily on locating trouble and repairing and overhauling defective electric motors and other electrical apparatus. He visually inspected parts for imperfections, examined dials and gages on testing equipment for short or open circuits, checked schematic diagrams, and planned details and sequence of operations for necessary repair work. Using a variety of hand and portable power tools, he dissassembled motors and other equipment, cleaned parts, made adjustments, and repaired or replaced worn parts. He also operated various stationary power machines (drill press, engine lathe, and others).

In performing his duties in the repair crib or shop or in the plant production areas, the repairman moved gear and materials both manually and by equipment such as handtruck, tricycle, and chain hoist. From time to time during the workday, he lifted without mechanical help objects weighing from 10 to 65 pounds. A small amount of push and pull effort, ranging from 15 to 35 pounds, was also required. Except for occasionally sitting at a workbench in the electric motor repair shop, or riding a tricycle to different trouble spots in the huge plant area, the repairman was on his feet most of the workday. He walked about and climbed stairs, ramps, and occasionally a ladder to reach a work area. He was 1 of 8 electric motor repairmen on the plant's day shift. Their average age was 40 and their service with the company ranged from 10 to 20 years.

The repairman suffered a heart attack early in 1965. When sufficiently recovered to be able to report back to work several months later, he received a medical reexamination as required by company policy; the physician found that the extent of standing, climbing, lifting, and movement required by his full job would be too strenuous for him. By agreement among the plant's examining physician, the safety engineer, and the motor repair foreman, the physical demands of the repairman's job were substantially altered to adjust it to the restriction of the man's functional activity.

The repairman was still required to perform all the basic duties of an electric motor repairman. However, he was no longer required to move about and work in the plant production areas but remained in the electric motor repair shop. The lifting demands were limited to items weighing no more than 20 pounds for a total of 30 minutes during an 8-hour shift, as opposed to the full-job weight effort of 65 pounds for possibly 2 hours of the shift. Push and pull effort was removed entirely from his specific job requirements. He was allowed to stand only 3 hours a day, on an intermittent basis, provided that at least 15 minutes of

each hour was spent sitting. Climbing of ladders and riding a tricycle were also removed from his specific job demands.

These adjustments enabled the repairman to resume work without discomfort or danger at a job in which he could use his skills and experience fully. The changes in the requirements of his job did not affect its skill classification or its rate of pay.

Crane Operator

The plant in question was engaged in processing slag (a residue of iron melting operations) to produce various types of aggregate for use in ready-mixed concrete and for other purposes. It employed about 50 workers. Its processing activities were an open-yard operation spreading over a 5-acre area that embraced several structures, piles of aggregate, and lines of railroad tracks. Cranes were used to move slag and aggregate in and out of the yard.

The job redesign relates to the work of the operator of an electric locomotive crane, which was used to load and unload various sizes of slag aggregate on and off open-top railroad cars.

Prior to redesign of the job, the crane operator had to put forth a great deal of physical effort working in the cab of the crane. To enter the cab, he climbed a short step-up ladder. He manually pushed and pulled three long-handled levers to actuate the booms (i.e., hoists) which either raised, lowered, or moved the bucket sideways. He also manipulated a lever to move the locomotive crane forward or backward along the track (third-rail powered). This involved the use of two friction clutch foot brakes, on which the operator had to place his full body weight while standing, to apply a braking action. Although he had a stool available, he could seldom sit down. To operate the levers and brakes he exerted considerable effort, using arm, leg, back and other muscles constantly. In the operator's own words, he "fought the machine all day."

There was only one electric locomotive crane at the plant, and consequently only one locomotive crane operator. His experience, muscular strength, and quickness and skill in the use of his hands and legs made the operator a highly valued employee.

The operator, who was 54 years of age and had operated a crane for most of his 25 years of service with the company, developed a painful skin disease on his legs and thighs. He lost strength and was having difficulty in standing. His work output declined. He was unable to continue working and left his job.

When the leg condition finally responded to medication, 21 months after leaving his job, he requested reemployment. He was now 56 years old. It was apparent he would have to work in a sitting position a good part of the time because his legs were still weak. Reassignment to another job was not feasible because all other jobs at the plant required standing most of the day. Moreover, the plant superintendent wanted to use the man's skill as a locomotive crane operator; replacements had not been very satisfactory.

The plant superintendent and a maintenance shop leadman knew that the locomotive crane controls and brakes would have to be modified to permit the operator to sit in the cab most of the day. They were aware of the improvements in control devices, such as easily operated mechanical foot brakes and pneumatic controls that could be substituted for the friction clutch foot brakes and long-levered manual controls with which the crane was originally equipped. The new parts were ordered and their installation took place over a weekend, at a total cost of about $500.

The operator was able to return to his job. He now manipulates short air-powered levers or valves to work the clamshell bucket and to move the crane along the track. He no longer has to reach, pull and push long-levered handles. Slight pressure on the valves moves the booms. The new mechanical brakes require very little pedal effort, enabling the operator to sit at his job most of the day. He has retained his previous job classification and pay rate level.

Material Handlers

The carpet manufacturing plant in which this case of job redesign occurred employed approximately 750 employees, of whom 610 were production workers. The average age of all production workers at the time of the study was 53, reflecting the plant's longtime position as the principal employer in a small town.

The warehousemen or material handlers at this plant had a physically strenuous job, requiring individual and team effort in lifting, handling, carrying and positioning of rolls of carpet weighing up to 800 pounds. The 11 men in this job usually worked in groups of 5 or 6. They had to manually lift and load the carpet rolls on dollies in the warehouse and push them to a loading platform, and then manually load the rolls onto freight cars or trucks. Each trip took about 15 to 20 minutes and covered approximately 150 feet. Removing the carpet rolls from the piled stacks in the warehouse and placing them in freight cars and trucks required frequent stooping, squatting, reaching, and climbing.

The average age of the 11 warehousemen was 55; their ages ranged from 46 to 68. All had a minimum of 25 years of service, and three were eligible for retirement. Because of an increasing number of accidents, and the advancing age of the men, the company management decided that some lessening of the heavy physical demands of the job was essential. The warehouse had been experiencing the heaviest incidence of injury among departments in the plant: 15 injuries were reported in the 5-year period preceding the job redesign, 6 of which resulted in lost time.

The plant's methods engineer and safety engineer decided that the most effective way to lower the physical requirements of the warehousemen's job would be to use a specially designed forklift truck with an 18-foot steel ramming rod or shaft, 4 inches in diameter, affixed to its front. The operator of the truck could lift and carry rolls with the rod, which could be lowered or raised as required. When inserted into the hard core paper center of a carpet roll, the operator could dislodge a particular roll from a stack of rolls and lift it for movement to the area or loading station.

Two of the specially designed forklift trucks were ordered. After some structural building changes to accommodate the 18-foot shaft, the system was fully implemented. Only 6 men were needed to do the work of the 11 men previously required. The average age of the six who stayed at the job was 54, with a range from 46 to 59. Of the remaining five, four men retired with benefits of a company pension and Federal social security payments. Their ages at retirement ranged from 63 to 68. The fifth worker, 58 years old, was transferred to a different department where his work was lighter. His earning level was unaffected.

The base pay rate of the six warehousemen who stayed on the job remained the same; however, the group incentive rates were revised to reflect the change in method. The increased output per man of the mechanized operation resulted in an approximately 15-percent net increase in workers' hourly earnings. In the 6 years since the job redesign, there have been only five work-incurred injuries, only one of which involved loss of time from work.

Top-Stitch Workers

A shoe manufacturing plant had about 7,700 employees, of whom 6,200 were production workers, most of them semiskilled. It required about 6 months for most workers to attain proficiency at the various shoemaking machines, which are the basic production equipment in use at the plant.

Among the machine operating jobs at the plant was that of the "top stitching" done by a group of 20 women. Most of them were over 50 years of age and had had long periods of experience at the work. The job involves stitching the shoe's lining to its upper leather on a sewing machine. Prior to the job redesign, the sequence of tasks was as follows: The worker walked from her sewing machine to a supply rack, 10 to 15 feet away, to collect a batch of materials—12 pairs of leather uppers for shoe tops and 12 pairs of linings—which weighed about 10 pounds. Finding the appropriate batches of leather and linings on the rack usually required squatting, stooping, and bending and occasionally some eye strain in looking for specific materials. She obtained her own thread and other supplies at nearby shelves and cabinets and returned to her machine to perform the stitching operation. She put the completed work in a box, which she later carried to a nearby area to make it available to the workers in the next operation. Each cycle required approximately 15 to 20 minutes.

Shortly before the job redesign was undertaken, the plant superintendent and department manager became aware that the productivity of the top stitchers had been declining seriously; it had fallen to 13 percent below standards set by time study

engineers. Moreover, the workers were complaining about the frequent bending, squatting, and stretching required to procure material from the supply racks. A steady increase in absenteeism was also taking place.

After studying the problem, management decided to redesign the job of the top stitchers by removing from it the chores that were not involved in the actual stitching or sewing operation. This called for assigning these tasks to two "service workers" chosen from among the 20 stitchers on the basis of personal bids. Two of the younger stitchers (only four were under 45 years of age) were chosen to fill these service jobs because of the physical demands of the nonsewing tasks.

After the job redesign the top stitchers (reduced to 18 in number) could sit and work at their machines uninteruptedly. Absenteeism declined and complaints about the work became infrequent. Productivity increased by 16 percent 2 months after the redesign.

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